REMARKS/ARGUMENTS

Claims 1-6 are pending. By this Amendment, claim 1 is amended. Support for the amendments to claim 1 can be found, for example, in the present specification at page 3, line 19 to page 4, line 5, and in original claim 1. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

Rejection Under 35 U.S.C. §103

The Office Action rejects claims 1-6 under 35 U.S.C. §103(a) over U.S. Patent No. 6,338,763 to Hashimura et al. ("Hashimura"). Applicants respectfully traverse the rejection.

Claim 1 recites "[a] steel wire for a high-strength spring having superior workability, the steel wire comprising tempered martensite, and comprising by mass: C: 0.53 to 0.68%; Si: 1.2 to 2.5%; Mn: 0.2 to 1.5%; Cr: 1.4 to 2.5%; Al: 0.05% or less, excluding 0%; at least one member selected from the group consisting of Ni: 0.4% or less, excluding 0%; V: 0.4% or less, excluding 0%; Mo: 0.05 to 0.5%; and Nb: 0.05 to 0.5%; and a remainder consisting essentially of Fe and inevitable impurities; wherein: the steel wire has a prior austenite grain size number of 11.0 or larger; and a ratio ($\sigma_{0.2}/\sigma_B$) of 0.2% proof stress ($\sigma_{0.2}$) to tensile strength (σ_B) in the steel wire is 0.85 or lower" (emphasis added). Hashimura does not disclose or suggest such a wire.

As indicated above, claim 1 requires that the steel wire has a prior austenite grain size number of 11.0 or larger and a ratio (σ0.2/ σB) of 0.2% proof stress (σ0.2) to tensile strength (σB) of 0.85 or lower. As discussed previously, these features provide the steel wire of claim 1 with superior fatigue properties, sag resistance and workability. *See, e.g.*, present specification, page 23, lines 4 to 5. The Office Action asserts that, e.g., although Hashimura does not indicate that the disclosed steel wire has a prior austenite grain size number of 11.0

or larger, "it is obvious that the prior austenite grain size number is 11.0 or larger since the chemical composition of the steel wire taught in Hashimura et al. overlaps with that of claim 1. *See* October 26, 2007 Office Action, pages 3 to 4. Applicants respectfully disagree.

Hashimura discloses a steel wire for a high-strength spring including (by mass): C: 0.4 to 0.7%; Si: 1.2 to 2.5%; Mn: 0.1 to 0.5%; Cr: 0.4 to 2.0%; Al: 0.0001 to 0.005%; at least one member selected from the group consisting of Ni: 0.1 to 2.0%, V: 0.050 to 0.4%, Mo: 0.1 to 2.0%, and Nb: 0.005 to 0.05%. *See, e.g.,* Hashimura, column 3, lines 6 to 67. The steel wire of Hashimura has a yield strength ratio of 0.8 to 0.9, or a yield strength ratio of not less than 0.8 and an amount of residual austenite of not greater than 6%. *See* Hashimura, column 4, lines 1 to 14. It is undisputed that Hashimura fails to disclose a steel wire having a prior austenite grain size number falling within the range recited in claim 1. *See* October 26, 2007 Office Action, pages 3 to 4. However, as discussed above, the Office Action asserts that the steel wire of Hashimura would obviously have a prior austenite grain size number of 11.0 or larger because the chemical composition of the steel wire in Hashimura overlaps with the chemical composition in claim 1. *See* October 26, 2007 Office Action, pages 3 to 4. Applicants demonstrate herein that this assumption cannot be made based on the teachings of Hashimura.

Applicants submit that the microstructure of steel wire not determined by chemical composition alone. Rather, the microstructure of a steel wire is determined based on both the chemical composition of the steel wire and the thermo-mechanical history of the steel wire. That is, the prior austenite grain size of a steel wire for a spring is changed drastically, not only by the chemical composition of the steel wire, but also by conditions during the manufacturing process such as heat treatment conditions and working conditions.

Applicants commend attention to steels H1 and H2 described in the present specification. The steels H1 and H2 have identical chemical compositions. *See* present

specification, page 20, Table 1. However, in preparing the steel H1, the heating rate before quenching in the oil tempering process is set at 250 °C/sec. *See* present specification, page 16, line 2. As a result, the grain size number of the steel H1 is 13.5 (within the range recited in claim 1). *See* present specification, page 21, Table 2. On the other hand, in preparing the steel H2, the heating rate before quenching is set at 20 °C/sec. *See* present specification, page 16, line 10. As a result, the grain size number of the steel H2 is 10.5 (outside the range recited in claim 1). *See* present specification, page 21, Table 2. Thus, different heating rates before quenching result in different prior austenite grain sizes in steel wires having the same chemical compositions – steel wires having the same chemical compositions can have grain size numbers falling both within and outside of the scope of claim 1. *See, e.g.,* MPEP §2112.IV (citing *In re Rijckaert*, 9 F.3d 1531 (Fed. Cir. 1993)) ("[t]he fact that certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of the result or characteristic" (emphasis in original)).

Hashimura does not disclose a heating rate before quenching of 250 °C/sec, as described above. Moreover, Hashimura provides no disclosure or suggestion of how to modify the disclosed manufacturing process to manipulate the prior austenite grain size numbers of the obtained steels, much less to obtain prior austenite grain size numbers of 11.0 or larger, as required by claim 1. *See, e.g.,* MPEP §2144.05.II.B (citing *In re Antonie*, 195 U.S.P.Q. 6 (C.C.P.A. 1977)) (stating that particular parameter must first be recognized as result-effective variable before determination of workable ranges can be said to be obvious). Accordingly, one or ordinary skill in the art would not expect, based on the teachings of Hashimura, that the prior austenite grain size numbers of the disclosed steel wires are 11.0 or larger, or that the grain size number could or should be modified to be 11.0 or larger.

Applicants further commend attention to the effect of setting a particular prior austenite grain size number (11.0 or larger) for the particular chemical composition recited in

claim 1. For example, the steel H2, which has a prior austenite grain size number of 10.5, has a sag resistance $\Delta\sigma_{0.2}$ of of 215, while the steel of H1, which has a prior austenite grain size number of 13.5 has a sag resistance $\Delta\sigma_{0.2}$ of of 351. *See* present specification, page 21, Table 2. These results show that sag resistance in steel wires according to claim 1 is sharply improved in comparison with conventional steels. Hashimura does not disclose the steel wire of claim 1, or the benefits stemming therefrom.

As explained, claim 1 would not have been rendered obvious by Hashimura. Claims 2-6 depend from claim 1 and, thus, also would not have been rendered obvious by Hashimura. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Double Patenting

The Office Action provisionally rejects claims 1 and 2 under the judicially created doctrine of obviousness-type double patenting over claims 1-4 of U.S. Patent Application No. 10/550,019. Applicants respectfully request the rejection be held in abeyance until the 019 application is allowed or the present application is otherwise in condition for allowance.

Conclusion

For the foregoing reasons, Applicants submit that claims 1-6 are in condition for allowance. Prompt reconsideration and allowance are respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

Jacob A. Doughty
Registration No. 46,671

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 08/07)